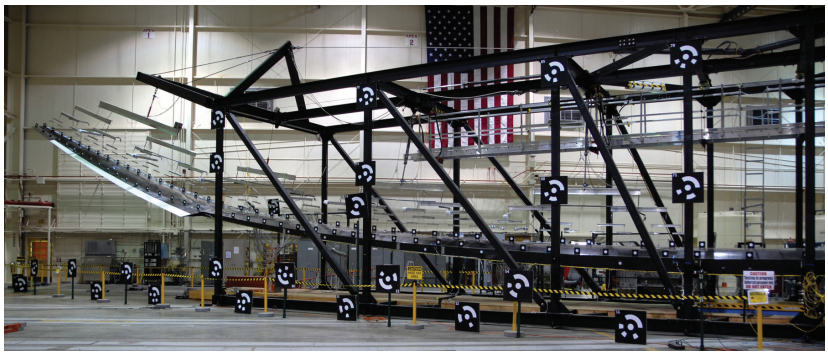
National Aeronautics and Space Administration

NASA'S Aeronautics Test Program

# Flight Loads Laboratory

The Flight Loads Laboratory (FLL) was constructed at NASA's Dryden Flight Research Center in 1964 as a unique national laboratory to support flight research and aircraft structures testing. FLL personnel conduct mechanical-load and thermal tests of structural components and complete flight vehicles in addition to performing calibration tests of vehicle instrumentation for real-time determination of flight loads. Mechanical loads and thermal conditions can be applied either separately or simultaneously to simulate combined thermal-mechanical load conditions. FLL personnel also conduct modal survey and structural mode interaction testing to support structures research and assess aircraft for flutter airworthiness.

The FLL's experienced and skilled technical staff provides expertise in ground and flight test design and operations; load, stress, dynamic, and thermal analysis; and instrumentation and measurement systems development. This expertise, coupled with a large array of capital equipment and advanced data acquisition and control systems, make the FLL an ideal laboratory for research and testing of aerospace vehicles and structures flying in the subsonic through hypersonic flight regimes.



## Facility Benefits

- Single facility capable of conducting mechanical, thermal, and structural dynamics research and testing.
- Combined thermal, mechanical, and structural dynamics testing allows for study of the effects of these combined conditions.
- Verification of static or dynamic structural performance at realistic flight temperatures.
- Conventional and high-temperature instrumentation for ground and flight testing.
- Fiber optic sensing technology for real-time distributive strain and temperature sensing.
- Photogrammetry system for non-contact strain and deformation measurements.
- Transient thermography for non-destructive evaluation of materials and structures.
- Location allows direct access to Dryden Flight Research Center and Edwards Air Force Base taxiways and runways, including the Rogers Dry Lake.

## Facility Applications

- Component and full vehicle testing
- Thermal, mechanical, and structural dynamics testing
- Key projects supported: X-15, X-24, YF-12, Space Shuttle, F-111 AFTI/MAW, X-30, F-15 ACTIVE, X-37, X-38, X-43, Orion Crew Module, F-18 AAW, E-2C Advanced Hawkeye, Global Observer

## Facility Characteristics

| | |
|---|---|
| **High-Bay Dimensions** | 164 ft wide by 120 ft deep by 40 ft high |
| **Mechanical Testing** | |
| Capability | Proof and loads calibration testing of aircraft components and structures |
| Channels | 84 channels of hydraulic load control |
| Loading equipment | Actuators and load cells for loads up to 300 000 lbf, load frames (220k, 100k, 25k lbf) |
| **Thermal Testing** | |
| Capability | Large-scale air and inert atmosphere testing |
| Channels | 264 channels of independent model-free adaptive control |
| Temperature range | -320 to >3000°F |
| Heating systems | Quartz lamp and graphite heating |
| Support systems | Large nitrogen atmosphere test chamber, 4000 gal liquid nitrogen supply, thermal-spray systems |
| **Structural Dynamics Testing** | |
| Capability | Modal survey and structural mode interaction testing |
| Systems | Portable data acquisition with 336 channels |
| Soft support | Self-jacking system (60k lb), overhead suspension systems (up to 14k lb) |
| Sensors | Room- and high-temperature, seismic and low frequency accelerometers |
| **Data Acquisition and Monitoring Systems** | |
| Data acquisition | 1920 data channels (expandable) |
| Fiber optic data acquisition | Distributive strain/ temperature systems with 10's of thousand sensors at sample rates up to 100 sps |
| Data display | Interactive Analysis and Display System (IADS) |
| Video | Networked video system |
| Communication | Wireless communication |

### Contact Information


www.aeronautics.nasa.gov/atp

**Thomas Horn**
Chief, Aerostructures Branch
Dryden Flight Research Center
661–276–2232
E-mail: thomas.j.horn@nasa.gov

**Larry Hudson**
FLL Chief Test Engineer
Dryden Flight Research Center
661–276–3925
E-mail: larry.d.hudson@nasa.gov





M–1870–15
February 2012